

at 8.40 p. m. it had entirely changed its shape and appeared as a narrow arch of about 2° in width, extending from the northeast to the northwest, and crossing the magnetic meridian at altitude 10°. The aurora was scarcely visible at 11 p. m.

Alpena, Mich.: an aurora was observed at 7.00 p. m. on the 25th, consisting of brilliant streamers and "merry dancers," extending to an altitude of 65° and covering the horizon from east to west; the aurora had an apparent motion from east to west, and was very brilliant at 11.30 p. m.; the display lasted until daylight of the 26th.

Port Huron, Mich.: a faint auroral light was visible from 9.30 until 10.15 p. m. on the 25th; it consisted of slender streamers reaching an altitude of 50°.

Lansing, Mich., 25th: an auroral light was observed in the north at 7.45 p. m., in the form of a curtain fold, with occasional streamers between northeast and northwest shooting up towards the zenith. The display was not brilliant, and had disappeared at 10.20 p. m.

Mr. Joseph Wood, voluntary observer at Bar Harbor, Me., reports, relative to this aurora, as follows:

"The display of northern lights on the evening of the 25th was the finest we have ever known, and we have seen many and grand exhibitions of the aurora. The brilliant spears of colored light, showing all the hues of the rainbow, flashed and crinkled across the northern heavens from east to west, and shot up in great sheets of flame in the northeast and northwest; the rosy light that passed to the zenith opened itself more than half way down to the southern horizon, forming a scene of grandeur rarely witnessed."

Eastport, Me., 25th: a brilliant auroral arch was observed from 6.40 to 11 p. m., having an altitude of 35°, and extending from northeast to northwest; eight beams or shafts of light, waving and flashing up to the zenith, were observed during the display.

Portland, Me.: a bright aurora was observed from 9 to 10.30 p. m. on the 25th; it consisted of waves of light, moving mostly eastward from a point a little to the east of north, with slender streamers reaching from near the horizon to the zenith.

Fort Totten, Dak.: a brilliant aurora was observed from 9.20 to 11 p. m. on the 27th; the display consisted of two parallel arches, reaching altitudes of 25° and 45°, respectively, with shooting beams extending nearly to the zenith and covering 120° of the horizon.

Saint Vincent, Minn.: an auroral light was observed at twilight on the evening of the 27th in the form of an arch; a partial corona formed about 15° or 20° northeast of the zenith at 9.35 p. m., at which time the arch had become striated and irregular, and at 9.50 had broken up into small fibrous clouds of whitish color. The aurora was most brilliant at 10.55 p. m., after which it faded somewhat, but was quite bright again at 11.15 p. m.

Moorhead, Minn.: an auroral arch was observed at 9.40 p. m. on the 27th; streamers of light shot upward, and waved to and fro as the display increased in brilliancy. At 10.05 the aurora assumed the "curtain" form, and showed a variety of colors. The display ended at 11 p. m.

ELECTRICAL PHENOMENON.

The Signal Service observer at Keeler, Cal., reports that during the evening of the 21st the atmosphere was so charged with electricity as to render telegraphic communication difficult.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various states and territories on the several dates as follows:

1st.—Colo., Dak., Iowa, Kans., Mich., Minn., Mont., Nebr., N. Mex., Oregon, Wis., Wyo.

2d.—Colo., Dak., Fla., Iowa, Kans., Mo., Mont., Nebr., N. Y., Tex., Wyo.

3d.—Ark., Dak., Ill., Iowa, Kans., Minn., Mo., Nebr., N. Mex., Wis., Wyo.

4th.—Ark., Dak., Fla., Ill., Iowa, Kans., Minn., Mo., Nebr., Wis.

5th.—Ariz., Cal., Dak., Ill., Ind., Iowa, Kans., Mich., Minn., Nebr., Wis.

6th.—Cal., Dak., Fla., Ill., Iowa, Kans., Mass., Mich., Nebr., N. H., N. Y., Ohio, Oregon, Pa., Wis.

7th.—Ariz., Ark., Colo., Conn., Fla., Ill., Kans., Me., Md., Mass., Nebr., N. H., N. J., N. Mex., N. Y., N. C., Ohio, Oregon, Pa., Tenn., Vt., Va., Wash., W. Va., Wyo.

8th.—Ariz., Colo., Dak., Fla., Iowa, Kans., Mass., Minn., Mont., Nebr., N. C., S. C., Va., Wash., Wis.

9th.—Ariz., Fla., Ill., Ind., Iowa, Kans., Mich., Mo., Nebr., Tex.

10th.—Ariz., Ark., Cal., Colo., Fla., Ga., Ill., Ind. T., Kans., Mo., Tenn., Tex.

11th.—Ark., Colo., Ill., Ind., Ind. T., Kans., Ky., Nebr., N. Y., Ohio, Wash.

12th.—Colo., D. C., Fla., Iowa, Kans., La., Mich., Mont., Nebr., N. J., Ohio, Tex., Utah, Va., Wis.

13th.—Ariz., Ark., Fla., Ill., Ind., Ind. T., Iowa, Kans., Mich., Mo., N. Y., N. C., Ohio, Pa., Tenn., Tex., Va., Wis.

14th.—Ala., Ariz., Ark., Dak., Fla., Ind., Ind. T., Kans., La., Me., Miss., N. Y., N. C., Ohio, Pa., S. C., Tenn., Tex., Va., W. Va.

15th.—Ala., Ariz., Ark., Colo., Fla., Ga., La., N. C., S. C., Tex., Va.

16th.—Ala., Ariz., Colo., Fla., Ga., Miss., Tenn., Tex.

17th.—Fla., Mass., Tex.

18th.—Ariz., Ind. T., Oregon, Tenn., Tex., Va., Wash.

19th.—Ariz., Me.

20th.—Ariz., Dak., Minn., Nebr., Tex., Va., Wis., Wyo.

21st.—Ariz., Cal., Colo., Dak., Ill., Kans., Mich., Nebr., N. Y., Ohio, Tex., Wyo.

22d.—Ariz., Cal., Colo., Ill., Iowa, Kans., Mo., Nebr., Ohio, Tenn., Tex.

23d.—Ariz., Colo., Nev., S. C., Utah, Va.

24th.—Nev., S. C., Utah, Wyo.

25th.—Kans., Nebr., Pa., Tex., Wyo.

26th.—Dak., Ill., Ind. T., Kans., Nebr., Pa., Tex.

27th.—Fla., Ky.

28th.—Fla., Ga., N. C.

29th.—Fla., Ill., Ind., Iowa, Mich., N. C., Ohio, S. C., Va., Wis.

30th.—Conn., Fla., Mass., Mich., N. J., N. Y., N. C., Ohio, Pa., Va.

OPTICAL PHENOMENA.

HALOS.

1st-3d.—Solar and lunar halos were observed on these dates in the central valleys, middle and south Atlantic states, preceding and accompanying the passage of low pressure area number ii from the lower lake region eastward to, and off, the Nova Scotia coast.

4-7th.—Lunar halos were reported from stations in the Mississippi Valley on the 4th and 5th, and from the Ohio Valley on the latter date. Solar halos were noted at widely separated stations east of the Rocky Mountains on the 6th, and on the 7th lunar halos were reported from scattering stations in the Missouri, upper Mississippi and Ohio valleys, and middle Atlantic states.

9-10th.—Solar halos were numerous in New England and the middle Atlantic states on the 9th and on the upper lakes on the 10th.

12th.—Solar halos in the Ohio and central Mississippi valleys.

16th.—Solar halos in the Ohio Valley and middle Atlantic states.

20th.—Solar and lunar halos in the lower lake region and middle Atlantic states.

26-30th.—During this period both solar and lunar halos were frequent in the states bordering on the Atlantic; it was also during these dates that area of low pressure number xi passed from the west Gulf coast to the upper lake region.

The phases of the moon, Washington mean time, during September, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: Full moon, 1st, 18 h. 4.4 m.; last quarter, 9th, 21 h. 55 m.; new moon, 16th, 20 h. 51.6 m.; first quarter, 23d, 11 h. 55.6 m.; apogee, 4th, 22.1 h.; perigee, 17th, 13.7 h.

MIRAGE.

Moorhead, Minn.: a mirage was observed at 3.00 p. m. on the 9th; elevators, buildings, trees, and other objects situated eighteen miles southeast of this place, were plainly seen. All

objects appeared to be considerably elevated above the surface of the ground; the phenomenon continued for more than half an hour.

Mirages were reported to have been observed at the following places:

Salina, Kans., 13th, 29th, 30th.
Henry, Dak., 15th.
Moorhead, Minn., 15th, 18th, 23d, 24th.
Marquette, Mich., 16th, 17th.
Reidsville, N. C., 18th.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Kingston, Ontario, 20th: on this date extensive brush fires prevailed in district between the Mississippi and Wilbur Mines.

Brainerd, Crow Wing Co., Minn.: on the 20th forest fires were raging southeast of this place; a large quantity of hay was destroyed.

Oswego, N. Y., 26th: the dense smoke settling over Lake Ontario from forest fires which are burning on the Canadian side renders navigation on the lake very dangerous.

Saint Vincent, Minn.: prairie fires were raging four miles southeast of station on the afternoon of the 20th, and extensive fires were burning southwest of station on the 30th.

Webster, Day Co., Dak., 30th: prairie fires have been very prevalent in this locality since the 20th.

INSECTS.

Quakertown, Bucks Co., Pa., 1st: caterpillars are destroying the leaves on trees and vines to a great extent in this vicinity.

University, Lafayette, Co., Miss., 10th: cotton worms have damaged the cotton crop considerably during the past week.

Lead Hill, Boone Co., Ark., 30th: during the latter part of August and the first half of September chinch bugs were very numerous, and greatly injured the corn in this county. The cotton caterpillar has also reappeared, but has done no serious damage. The bollworm has done considerable injury to cotton in this section.

East Portland, Oregon, 30th: a species of slug has made its appearance in large numbers in this vicinity; it destroys the leaves of plants and also enters the ground and eats sprouting seeds.

METEORS.

Fort Maginnis, Mont.: a meteor of considerable brilliancy passed over this place from southeast to northwest at 12.10 a. m. on the 10th.

Willows, Colusa Co., Cal.: a beautiful meteor was observed in the east at 8.30 p. m. on the 27th; it moved northward about 25°, was as bright as Venus, visible five seconds, and before disappearing separated into several pieces.

During the evening of the 15th a meteor was observed at many stations in New England and the Maritime Provinces of Canada, and by several vessels over adjacent portions of the north Atlantic. While many of the reports concerning this meteor, as given by the public press, were probably exaggerated, the phenomenon was undoubtedly of more than ordinary interest, and the extent of the area over which it was observed and other characteristics noted during its flight were exceptional.

Below are given some of the numerous reports which have reached this office:

Capt. T. L. Rogers, of the s. s. "Wylo," reports: "September 16th, 1.08 a. m., Greenwich mean time, when six miles south of Bird Rocks, Gulf of Saint Lawrence, saw a brilliant meteor descend from an elevation of about 20°, bearing ssw. true, and falling a little to the westward of the perpendicular. It had a very large and bright appearance, and its trail had a vermilion brightness which may have been caused by the hazy state of the atmosphere. The wind was northwest and the weather fine, but a little hazy, and the barometer steady at 30.08."

The following are extracts from an Augusta, Me., "special," dated the 18th, to the "New York World":

As seen here (Augusta, Me.) it burst forth at a point about midway between the zenith and horizon in the eastern heavens, shooting at about an angle of 45° northward and maintaining its brilliancy until it dropped behind the hills. Its movement was not very rapid and it was several seconds in passing before the vision. An eye witness describes it as being "large as a cart wheel and equipped with a tail thirty feet in length. The nucleus or head rivalled the electric light in brightness, while the brush-like tail was of a pinkish hue."

Reports from various country towns are that many of the people were overcome with fear, and some even took refuge in their cellars. Those who did not get a distinct view of the meteor, but saw the light, regarded it as a flash of lightning and listened for the roll of thunder. The fall was two minutes before eight o'clock in the evening and the sky was cloudless.

In Bangor, seventy miles east of here, the meteor was still more prominent and created much excitement.

At Halifax its appearance was accompanied by a terrific concussion and a sound heard like that of a heavy clap of thunder, followed by detonations at intervals for several seconds. People rushed from their houses in alarm, fearing that an earthquake was at hand. Indeed, the earth trembled perceptibly. Intelligence from Saint John's, Newfoundland, says that the great fire ball was distinctly seen there, and, after it had disappeared, a thin luminous cloud apparently lay at that point in the heavens where it first burst forth.

Sergeant Paul Daniels, Signal Corps, New York City, furnishes the following report copied from the log of the British s. s. "France," Capt. A. D. Hadley, commanding; Mr. John Rees, first officer:

September 16, 1887, at 9.15 p. m., ship's time, in lat. 41° 31' N., and long. 68° 48' W., observed a very large meteor, bearing from the ship north, and travelling in an altitude of about 45° above the horizon; had the appearance of a rocket and was very brilliant, so much so that the ship's deck was so illuminated as to enable a person to pick up a pin. It lasted about six seconds, and was of a light blue tint, resembling sulphur on fire. Weather at the time, clear; many stars visible. Barometer, 30.04 (corrected). Temperature of air, 67°; water 68°, and calm. Weather before and after phenomenon clear, and sea smooth.

Sergeant J. H. Melton, Signal Corps, Boston, Mass., forwards the following abstract from the log of the s. s. "British Crown," Capt. A. Smith, commanding; Mr. Francis Potts, second officer.

September 15, 1887, in 42° 50' N., 68° 15' W., at 9 p. m., observed a large meteoric body, intensely bright, fall from the zenith in an easterly direction, which completely illuminated the whole heavens for about five seconds, and disappeared at an altitude of about 10° from the horizon to eastward. It resembled a ball of fire about two feet in diameter and was followed by a bluish trail of light. It at first appeared to fall very near the ship, but passed off to eastward in its descent. Immediately after its disappearance the sky and heavens became blindingly dark.

The following is from the "Portland (Me.) Press" of September 22, 1887:

Boston, September 21.—Captain Walker, of the Cunard steamship "Cephalonia," just arrived in Boston, reports having seen the meteor on the night of September 15th at 8.30 o'clock. At this time the steamer was in N. 42° 28', W. 66° 22'. The meteor was observed to the east-northeast, and was very brilliant, sparks radiating from the centre, and it had a long, fiery tail. The sky was brilliantly illuminated for the space of six seconds. The meteor fell into the sea about half a mile from the ship.

The "Bulletin of the New England Meteorological Society" for September, 1887, contains the following:

A large meteor of brief duration was noticed by several observers a little after 20 h. on the 15th. A newspaper report states that it was followed by a terrible roaring noise at Barrington, N. S., where it was seen in the southeast, moving to the south. It appeared overhead at Bar Harbor, Me., and moved southeast. At Grafton, N. H., it was seen in the east or southeast, at an altitude of 25°, first red, then yellow, when it disappeared below the horizon, leaving a long trail visible. At Leominster, Mass., it moved through the eastern sky from Pegasus to Aries. At North Truro, Mass., it fell to the east-northeast. At Nantucket, Mass., and at Setauket, N. Y., the meteor was not seen, but the sky was lighted up by it. It was probably nearly a hundred miles above the earth when it became visible.